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**METHOD, PRINTING APPLIANCE AND COMPUTER PROGRAM
PRODUCT FOR PRINTING A FILE ON A STACK OF SHEETS
CONTAINING INSERTED INDEX SHEETS**

- 5 The invention concerns a method to print a file on sheets with register pages inserted in between them, as well as a method for printing a file on a register page.

Methods for printing of files on register pages are known. Register pages are typically rectangular sheets made from a rigid paper or cardboard with a flag that
10 protrudes one piece at [sic] the rectangular region. Method for printing of register pages are, for example, known from US 5,33,161 [sic], US 6,163,784. US 5,519,501, US 5,201,622, US 5,946,461 and US 4,539,653. The methods often concern the positioning of the print image on the flag or, respectively, the selection of the corresponding data that are to be printed on the flags. There are also
15 methods in which the print image to be printed on the flags can be monitored (US 5,519,501).

The patent application US 2001/0043365 specifies a system for the professional printing and binding of documents. This business area is designated as
20 "production printing", wherewith the difference relative to printing systems of private users is emphasized. With the system specified here, printing groups with register pages can be printed and bound. So that the flags of the register pages can be correctly printed, markers (flags) are incorporated into the print file that respectively describe one register page. These register pages are then
25 automatically picked up by the printer and printed during the print event and inserted between the further sheets of the printing group.

Professional printing systems are often equipped with a function that allows the automatic printing of register pages.

If a print job is executed that also contains the printing of register pages and an error occurs, it is thus very involved to correct this in the known systems. On the one hand, register pages must be manually inserted into the corresponding input tray, such that only complete sets of register pages are present, or the uppermost
5 set of register pages must be manually supplemented such that a suitable register page lies on top that is picked up as the next by the present (possibly interrupted) printing event, printed and sorted into the further sheets to be printed.

Additionally, the known methods are not very flexible since a corresponding stack
10 of register pages must be inserted into the input tray and the control must be correspondingly changed given use of a set of register pages with a different total number of register pages.

Known methods are difficult to integrate into automatic production processes for
15 printing of documents divided by means of register pages, since errors in the production process cannot be automatically remedied and they are additionally not very flexible.

From WO 01/67266 A1, a printing system and a method for printing a print job are
20 known with which a print job can be printed. This print job can comprise register pages and further pages to be arranged between the register pages. The register pages as well as the further pages are automatically picked up from the respective output shafts, printed and output.

25 DE 691 08 500 T2 (=EP 0 478 354 B1) concerns an electronic reprography system that comprises a scanner and a printing system. The printing system comprises a paper feeder in which the paper to be printed is transported. This system is equipped with a device, in particular a video camera, for automatic detection of an error. If an error is detected, the page in which the error has been established and
30 all subsequent pages located in the paper feeder are separated out to a defined separation location. Additionally, up to three pages before the page in which the

error has been determined can also be separated out. With this system, the pages located in the paper feeder are removed upon occurrence of an error. An automatic error remedy method is subsequently executed and the copy or, respectively, print event is continued at a suitable point.

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The invention is based on the object to achieve a method for printing a file on sheets with register pages inserted between them that enables both a simple error elimination and a larger flexibility in the printing of the register pages.

- 10 The object is achieved via a method with the features of the claim 1.
Advantageous embodiments of the invention are specified in the sub-claims.

With the inventive method, a file is printed on sheets with register pages inserted in between them, whereby the file contains register page file parameters that specify
15 the structuring processes. In a print control device, register page print parameters are stored that describe a stack of register pages present in an input shaft.

In the event that, upon printing the file, using the register page file parameters it is determined that a register page is to be printed, the register page file parameters
20 specifying the register page to be printed are compared with the register page print parameters in order to establish whether the next register page to be drawn from the input shaft coincides with the register page to be processed. In the event that this is not the case, so many register pages are drawn from the input shaft and supplied to an output shaft until a register page coinciding with the register page to
25 be printed is drawn from the input shaft and this is, if applicable, processed and supplied to an output shaft accommodating the sheets. The register page is hereby inserted between the printed sheets and sheets stacked in the output shaft.

The term "processing of register pages" means that a register page is either printed
30 with a key, for example in the region of the flag, and/or is sorted into a stack of sheets in order to separate individual sections in the stack. To fulfill this separation

function, it is not always necessary that the register pages be printed, in particular when register pages are used are [sic] innately printed with a key.

5 The inventive method uses the fact that a set of register pages typically comprises only five to twenty (possibly thirty) register pages and a plurality of stacks or, respectively, sets of identical register pages are stored in an input tray. It is therefore possible, in the event that the association between the register page file parameters and the register page print parameters should be incorrect, that some register pages are drawn from the input shaft until the association is established
10 again. In other words, this means that, given a discrepancy between the register page file parameters and the register page print parameters, this is remedied via adaptation of the register page print parameters to the register page file parameters.

In the worst case, the total number of the register pages of a set minus one register
15 page must be drawn from the input shaft.

The inventive method can be very simply implemented in existing printing systems and completely automatically executed. The correct association of the register page print parameters with the register page file parameters can be established
20 again at any time, for example after a paper jam or another interruption of the print event. No manual intervention whatsoever is necessary for this. This leads to a significant cost reduction given the use of register pages in a printing process. Since errors in the use of register pages are minimized or, respectively, automatically remedied via the inventive method, the quality of the printing
25 process is significantly increased.

With the inventive method, register pages of a stack of register pages that have not been used in a preceding print job are also automatically removed from the input shaft in the event that a first register page of a stack of register pages is requested
30 again. Also, in the inventive method it is possible with the register page file parameters of a file to be printed to initiate only every x-th register page of a stack

of register pages, whereby every i-th register page with i unequal to x is automatically removed from the input shaft. If, for example, fewer register pages are necessary than are contained in the stack, it can be advisable, for example, to pull in, to process and to insert between the printed sheets only every second or
5 third register page of a stack. In the inventive method, this can only be executed via determination of the register page file parameters in the Thereby [sic] defining the print job .

The invention is subsequently explained in detail using the exemplary embodiment
10 shown in the drawings. Shown in the drawings are:

- Figure 1 a set of register pages with individual flags in plan view,
- Figure 2 a set of register pages with flags according to the waterfall
15 principle,
- Figure 3 schematically in a block diagram, a system to execute the inventive method that comprises a correspondingly fashioned printer,
- 20 Figure 4 the inventive method in a flow diagram, and
- Figure 5 a register page with two logical sides.

Register pages 1 (Figure 1, 2) exhibit a rectangular area 2 with a strut-shaped
25 section that extends somewhat over the edge of the area 2 and is designated as a flag (3).

In Figure 1, a set of register pages is shown that are fashioned with single flags 3. The single flags are arranged on the right edge of the area 2 in the plan view. The
30 flags 3 exhibit a length L. The register pages of a set are fashioned and sorted such that the flags 3 of two register pages adjacent in the set are respectively displaced

relative to one another by the length L . In the set of register pages shown in Figure 1, the flag 3 of the uppermost register page is fashioned terminating flush with the upper edge of the register page, and the flags of the register pages lying underneath are respectively displaced by the length L in the direction towards the lower edge
5 of the register pages, such that all flags 3 are completely visible in the plan view of the complete set of register pages. The register pages in Figure 1 are sorted from 1 – n . There are also sets of register pages that are sorted in reverse ($n - 1$).

Figure 2 shows a set of register pages with flags 3 according to the waterfall
10 principle. The flags are again fashioned at the right edge 6 of an area 2 in the plan view. The flags 3 respectively extend from the upper edge 4 along the right edge 6 in the direction towards the lower edge 5. The flag 2 of the uppermost register page ($i=1$) extends over a length L from the upper edge 4 in the direction towards the lower edge 5. The flag 3 of the second register page ($i=2$) extends over a
15 length of $2L$ from the upper edge 4 in the direction towards the lower edge 5, and the i -th register page extends from the upper edge 4 over a region of iL in the direction towards the lower edge 5. In these register pages with the flags according to the waterfall principle, respectively one region of the length L is visible from each flag 3 in a stack of the register pages. In this visible region, the flags 3 can be
20 printed with an ordering specification. A printable region 7 is thus arranged in this visible flag region.

Figure 3 schematically shows a system to execute the inventive method. This system comprises a computer 8 on which an application program to create a file to
25 be printed (such as, for example, a text processing program, a character program or the like) is stored and can be executed. The computer 8 comprises an operating system that is provided with a printer driver 9 in which the file to be printed is prepared for a specific printer type or according to a specific print format (Postscript, PCL, PPML, AFPDS, PDF, IPDS, etc.) before it is sent to a printer 11
30 via a data line 10. The printer 11 comprises a controller 12 in which the files to be printed are converted into a control signal to control a printing unit 13. The printer

is also provided with a control device 14 that is a processor unit and controls the activity of all individual elements, such as, for example, input shafts 15, powered paper transport rollers 16, the printing unit 13, a fixing station 17 and output shafts 18.

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The control device 14 is connected with the control 12 via a data line 19 via which it [sic] are transmitted either a complete copy of the incoming file to be printed or at least all of the data of the file to be printed necessary for control of the print 11, such as, for example, the number of the sheets to be printed and their formats as
10 well as the communication that the control signals for specific pages are prepared by the controller 12 and are ready for printing. Using these signals, the control device 14 controls the input shafts 15 such that a predetermined sheet to be printed (such as, for example, a white page of paper of a register page) is drawn from a specific input shaft 15/1, 15/2, 15/3, is supplied to the printing unit 13, is printed
15 there if applicable, is further transported from the printing unit 13 to the fixing station 17, and there is fixed and then deposited in a predetermined output shaft 18/1, 18/2, 18/3.

In the inventive printer 11, register page print parameters that exactly describe the
20 sets of register pages stored in an input shaft (for example the shaft 15/1) are stored in the control device 14. The register page print parameters thus contain ordering criteria according to which the register pages stored in the input shaft 15/1 are sorted. The register page print parameters can, for example, be comprised only of a type designation of the register pages and the number of the register pages stored
25 in the shaft 15/1. A further suitable distribution of the register page print parameters is stated in the following table:

Index	Tab ID	Basic format	Manufacturer	Sorting inverse/successive	Sorting n	Waterfall single flag	Flag width in mm	Flag height in mm inner/edge	Edge cut in mm	Edge steepness
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Hereby denoted:

- 5 Index: the number of the register page sets present in the input shaft,
- Tab ID: the number of the uppermost register page in a complete set of register pages,
- 10 Basic format: a standardized base format,
- Manufacturer: a designation of the manufacturer of the register pages,
- Sorting: whether the register pages are sorted from 1-n or, respectively, n-1,
- 15 Distribution: the number of register pages in a complete set of register pages,
- Waterfall individual flags: whether the register pages are fashioned with individual flags or according to the waterfall principle,
- 20 Flag width: in mm, for example a flag width of 13 mm,
- The flag height: in mm, a flag height of, for example, 48 mm,
- Edge cut: in mm, an edge cut of, for example, 7 mm, and
- 25 Edge steepness: a specific standardized edge steepness.
- The register page print parameter can be adjusted via a user interface on the printer or be read out from a setup file or be loaded via a loadable file.
- 30

The file to be printed contains register page file parameters that are created in the application software on the computer 8 and describe the register pages in a corresponding manner. The format of the register page file parameters can be identical to the format of the register page print parameters. This format must at
5 least be fashioned such that the parameters contained therein can be converted by the controller 12 or, respectively, the control device 14 such that they can be related to the register page print parameters stored in the control device 4.

Using the register page print parameters, not only is the pick-up of a register page
10 from the input shaft 15/1 controlled by the control device 14, but rather the printing in the printing unit 13 is as well. This is elaborated on below.

The inventive method for correction of errors in the control of register pages is subsequently explained using the flow diagram shown in Figure 4. This method
15 begins with the step S1. Given pick-up of a register page from the input shaft 15/1, it is checked by the control device whether a suitable register page already lies in the input shaft 15/1, i.e. that the register page to be drawn next, which is normally the uppermost register page in the shaft 15/1, exhibits the format that is required by the file to be printed, i.e. is a register page with a specific flag. This check occurs
20 via a comparison of the register page print parameters with the register page file parameters (S2). When the format of the register page file parameters is identical to that of the register page print parameters, the comparison is a comparison in the strictly mathematical sense, whereby the identity of both parameter sets is checked. If the format of the register page file parameters differs from that of the register
25 page print parameters, the comparison corresponds to a mapping (injective, surjective or bijective) of the register page file parameters to the register page print parameters according to a predetermined mapping instruction and the comparison of the mapped parameters.

30 If no suitable register page lies ready for pick up in the input shaft 15/1, a register page is drawn (S3) from the input shaft 15/1 and supplied to one of the output

shafts 18. It is subsequently checked again whether register page print parameters coincide with the register page file parameters (S2). When this is the case, this means that as many register pages have been drawn from the input shaft until a suitable register page already lies in the input shaft 15/1. The method for
5 compensating the register page print parameters with the register page file parameters is therewith ended (S4).

This method is stored as a software module in the control device 14.

10 The register pages drawn up to the presence of a suitable register page are subsequently designated as discarded register pages. The suitable register page can now be picked up, supplied to the printing unit 13, if applicable printed and be supplied to one of the output shafts 18. Since a complete set of register pages ultimately comprises a small number of pages, for example 5 to 30 pages, in the
15 worst case the number of register pages to be discarded is the total number of the register pages of a set minus one.

The discarded register pages can either [sic] be deposited in one of the output shafts 18/3 separate from the other register pages and the printed sheets that
20 aerobic, for example, deposited in the shaft 18/1. The discarded register pages are hereby automatically separated from the generated stream of printed sheets and register pages. However, if the printer comprises only a single output shaft, it is in principle also possible that the discarded register pages are printed with a corresponding error marking, for example in the print region of the flag. An
25 operator of the printer must then remove the register pages provided with the error marking from the stack of register pages and printed sheets.

The method specified above to pick up and discard unsuitable register pages can be executed fully automatically. With this very simple method, different problems are
30 solved in the area of the printing of register pages. If, for example, a paper jam exists in the printer, typically the jammed and incorrectly printed or, respectively,

not yet fixed sheets and register pages are removed from the printer. It can hereby be that the register page file parameters of the file to be printed are reset by the number of the sheets and register pages removed in the paper jam. The register page file parameters that, for example, control the first register page of a set hereby
5 deviate from the register page print parameters describing the stack of register pages in the input shaft 15/1, said register page print parameters describing, for example, the i-th register page. This difference is, as explained above, remedied via pick-up of register pages from the input shaft and discarding of the same until the register page file parameters coincide with the register page print parameters.

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The resetting of the register page file parameters in the file to be printed occurs, for example, by means of a counter 20 arranged in the printing unit 13 and/or a counter 20 arranged in the fixing station 17 and/or one or more counters 20 arranged at the output shafts 18 that respectively count the number of the sheets or,
15 respectively, register pages passing through the printing unit 13 or, respectively, the fixing station 17 or, respectively, count the number the of the sheets or, respectively, register pages deposited in the output shafts 18. The use of such counters to determine the sheets and register pages incorrectly printed due to a paper jam and for corresponding resetting of the page count of the file to be printed
20 is known.

Fill state counters 21 (21/1, 21/2, 21/3) are preferably arranged at the input shafts 15 that determine the fill state of the individual input shafts 15 and using which the control device 14 can correspondingly update the register page print parameters.

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However, if the conveyer is so reliable that no errors should occur in the region of the input shafts upon pick-up of register pages or sheets, such counters are not necessary since the control device 14 can track the inventory of register pages solely via the controlled pick-up of the sheets and register pages.

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In the region between the printing unit 13 and the output shafts 18, the most different combinations of the arrangement of counters 20 in order to monitor the

current of printed material are also known. For the invention, it is significant that it can occur given a paper jam that a register page already lies in the input shaft 15/1 as a next register page to be drawn that is unsuitable for the further printing process, and this problem is remedied by compensation of the register page file parameters with the register page print parameters.

A further problem in conventional methods is when the number of necessary register pages in a print task or, respectively, print job is less than the number of an available stack of register pages. In conventional methods, the existing set of register pages in the input shaft would have to be exchanged with another set of register pages with a correspondingly adapted number of register pages. This problem is inventively remedied in that when, for example, only m register pages of a set with n register pages have been used in a print job, the remaining n-m register pages are automatically picked up before the next print job and discarded, such that a complete stack of register pages is again present in the input shaft.

If register page stacks fashioned according to the waterfall principle are used, in the event that only a few register pages of a stack are necessary to divide a print job, for example every i-th, for example every second or every third register page of the stack can thus be used. With the inventive method, only the register page file parameters of the print file are selected for this, such that only every i-th register page is activated. Should, for example, only every second register page be activated, only the first, third, fifth, etc. register page of a stack will be picked up and used to separate individual sections of a print job. However, if the second, fourth, sixth, etc. register page are present in the input shaft, a deviation results between the register page file parameters and the register page print parameters that is automatically remedied with the inventive method without further control instruction via pickup and deposition of the unnecessary register pages.

With the inventive method, different problems that, for example, occur given the occurrence of a paper jam or given use of only a partial quantity of the register

pages of a complete set of register pages are thus solved in a very simple manner. The inventive method can be simply and retroactively integrated into existing printing systems. It is in particular suitable for high-capacity printing systems on which complex print jobs are executed fully automatically.

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The inventive printer can optionally be provided with a sensor (for example a light barrier) to monitor the edges of the register pages. Sorting errors within a set of register pages can hereby be detected. This allows the automatic correction of erroneously sorted sets of register pages.

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It is often desired that the register pages are printed, in particular in the region of their flags. For this, a side format or, respectively, a logical side can be set up that surround the area 2 and each flag 3 of a set of register pages. Within this logical side, any arbitrary point (and therewith also the region of the flags) can be accessed for printing. However, this method possesses the disadvantage that in principle regions that laterally terminate at the flags and are not present in the register page can also be printed.

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In a preferred method to control the printing event, a logical side 22 that provides the region of the area 2 of a register page and a further logical side 23 that define the printable region of the print flag are therefore provided for each register page. Using the register page print parameters, the positions of the logical sides 22, 23 for each individual register page are determined such that the register pages can be completely printed, however via the provision of the logical sides no region can be printed in which the register page should not be developed. This method can be integrated simply into a known AFPDS/IPDS print data stream, whereby here the N-up functionality is used in which a plurality of logical sides can be defined for a sheet to be printed. This method to control the printing event can also be used independent of the method specified above, in which unnecessary register pages are drawn from the input shaft and not further processed, and thus represents an independent inventive idea.

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If register page print parameters are used that completely describe the shape of the register pages, such as, for example, the parameters stated above in the table, these
5 register page print parameters can be used for definition of the printable region of the register page. A single printable region is hereby defined that exactly establishes the entire printable region of a register page, such that no region can be accessed in which the register page is not designed. Since the register page print parameters and the register page file parameters are fashioned corresponding to
10 one another, the regions of the register pages to be printed can be defined in the same manner by means of the register page file parameters in the application software and corresponding commands can be made upon creation of a file to be printed. The use of the register page print parameters for definition of the region of a register page to be printed can be used independent of the method explained
15 above for pick-up of unnecessary register pages.

The invention is described above using an exemplary embodiment in which the register page print parameters are inserted into the file to be printed upon the creation of the file to be printed. In the framework of the invention, it is also
20 possible that the register page file parameters are incorporated into an additional file and this is coupled with the file to be printed. Such an additional file is, for example, the job ticket for print jobs, which can contain the register page file parameters. In the framework of the invention, the expression "printing of a file" is to be understood to the effect that the file can comprise a group of files in which
25 the data to be printed is distributed. This allows, for example, the creation of register page file parameters independent of the file that contains the text to be printed and corresponds to a subsequently sorting of register pages.

In the exemplary embodiment specified above, the register pages are deposited in a
30 single input shaft. In the framework of the invention, it is naturally also possible to distribute register pages in a plurality of input shafts. For example, it can thus be

appropriate to deposit each type of register page with a specific flag in a separate input shaft. It is equally possible to respectively provide one input shaft for different sets of register pages.

- 5 The invention can be briefly summarized as follows:

The invention concerns a method to print a file on sheets with register pages inserted between them.

- 10 Unsuitable sheets are automatically pulled from the input shaft and deposited in an output shaft. Problems that occur given a paper jam or in the use of only a part of a set of register pages are automatically remedied. The inventive method is simple and can be retrofitted in existing printing systems.

Reference list

	1	register page
	2	area
5	3	flag
	4	upper edge
	5	lower edge
	6	right edge
	7	printable region
10	8	computer
	9	printer driver
	10	data line
	11	printer
	12	controller
15	13	printing unit
	14	control device
	15	input shaft
	16	paper transport roller
	17	fixing station
20	18	output shaft
	19	data line
	20	counter
	21	counter
	22	logical side
25	23	logical side